DOCUMENT RESUME

ED 138 967 CS 003 483

AUTHOR Venezky, Richard L.; And Others
TITLE Summary of Studies for an On-Line Reading Diagnosis System-III. Technical Report No. 409.
INSTITUTION Wisconsin Univ., Madison. Research and Development Center for Cognitive Learning.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE Mar 77
CONTRACT NE-C-00-3-0065
NOTE 76p.

EDRS PRICE MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS *Computer Assisted Instruction; Elementary Education; *Reading Research; *Reading Skills; *Reading Tests; Test Construction; Test Validity; Vocabulary
IDENTIFIERS *PLATO

ABSTRACT

Three studies were performed to test the feasibility of the PLATO Computer Assisted Instruction system for on-line testing of reading skills. In Study 1, three different approaches to vocabulary assessment were tested: self-screening, synonym, and word matching under brief exposure. One hundred ten subjects from a Chicago, Illinois, public elementary school received from one to three levels of each test format via PLATO terminals. Branching to levels within each format was under program control. The results revealed problems both with test formats and with test items. Based on these results, improvements were made to the testing programs and a second group of 95 subjects was run. The results from these tests showed an expected range of scores for the Synonym and Self-Screening Tests but cast further doubt on the validity of the Timed Exposure Test. A third study, directed toward the validity of this test, led to the rejection of the timed exposure paradigm. (Author)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED138967

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Technical Report No. 409

SUMMARY OF STUDIES FOR AN ON-LINE READING DIAGNOSIS SYSTEM-III

by

Richard L. Venezky, James Perry,
Susan Chicone, and Susan Pittelman

Report from the Project on
Conditions of School Learning and
Instructional Strategies

Richard L. Venezky
Faculty Associate

Wisconsin Research and Development
Center for Cognitive Learning
The University of Wisconsin
Madison, Wisconsin

March 1977

CS003 483

Published by the Wisconsin Research and Development Center for Cognitive Learning, supported in part as a research and development center by funds from the National Institute of Education, Department of Health, Education, and Welfare. The opinions expressed herein do not necessarily reflect the position or policy of the National Institute of Education and no official endorsement by that agency should be inferred.

Center Contract No. NE-C-00-3-0065

3

WISCONSIN RESEARCH AND DEVELOPMENT CENTER FOR COGNITIVE LEARNING

MISSION

The mission of the Wisconsin Research and Development Center for Cognitive Learning is to help learners develop as rapidly and effectively as possible their potential as human beings and as contributing members of society. The R&D Center is striving to fulfill this goal by

- conducting research to discover more about how children learn
- developing improved instructional strategies, processes and materials for school administrators, teachers, and children, and
- offering assistance to educators and citizens which will help transfer the outcomes of research and development into practice

PROGRAM

The activities of the Wisconsin R&D Center are organized around one unifying theme, Individually Guided Education.

FUNDING

The Wisconsin R&D Center is supported with funds from the National Institute of Education; the Bureau of Education for the Handicapped, U.S. Office of Education; and the University of Wisconsin.

ACKNOWLEDGMENTS

The work reported here was done in cooperation with the PLATO Reading Project at the University of Illinois. The assistance of Priscilla Obertina and Bob Yaeger is gratefully acknowledged.

We also acknowledge with thanks the assistance of Mrs. Eileen Greene, principal of Francis Parker Elementary School, Chicago, Illinois, and her teachers and students; Dr. Hazel Wagner of the Department of Research and Evaluation of the Chicago Public Schools; Dr. Chris Dimas, Director of the PLATO Project for the City Colleges of Chicago; and Mr. Errol Magidson, PLATO Coordinator at Kennedy-King College.

TABLE OF CONTENTS

		Page
	Acknowledgments	iv
	List of Tables	ix
	List of Figures	x
	Abstract	xi
I.	Introduction	1
II.	Study 1	3
	Method	3
	Subjects	3
	Procedure	4
	Results and Conclusions	5
	Warm-up	13
	The Tests	13
III.	Study 2	15
	Method	15
	Stimuli	15
	Subjects	15
	Procedure	15
	Results	16
	Conclusions	16
IV.	Study 3	23
	Introduction	23
	Method	23
	Stimuli	23
	Subjects	23
	Procedure	23
	Results and Conclusions	24
	Conclusions	25
	References	27

TABLE OF CONTENTS (cont.)

		Page
Appendices		
A	Summary of Available Tests	29
B	Bibliography of Reading Research	51
C	Stimuli for Studies 1 and 2	55
D	Stimuli for Study 3	65
E	A Note on PLATO Timesharing	69

LIST OF TABLES

Table		Page
1	Numbers of Subjects and Mean Reading Scores By Grades For Study 1	4
2	Test Entry Levels For Study 1	5
3	Numbers of Subjects and Mean Reading Scores By Grades For Study 2	15
4	Test Entry Levels For Study 2	16
5	Percentages Correct For Each Exposure Time--Study 3 . . .	24
6	Percentages Correct For Each String Length--Study 3 . . .	25
7	t-test Values For Study 3	26

LIST OF FIGURES

Figure		Page
1	Self-screening vs. Synonyms--Study 1	6
2	Self-screening vs. Timed Exposure--Study 1	7
3	Synonyms vs. Timed Exposure--Study 1	10
4	Self-screening vs. Synonyms--Study 2	17
5	Self-screening vs. Timed Exposure--Study 2	18
6	Synonyms vs. Timed Exposure--Study 2	20

I

INTRODUCTION

This is the third of three reports on the feasibility of using the PLATO system for on-line diagnosis of reading skills. In the first study (Venezky, Bernard, Chicone, & Leslie, 1975), a comparison was made between on-line and paper-and-pencil administration of a comprehension test for fifth and sixth graders. This study demonstrated that equivalent scores could be obtained and that PLATO was usable at these grade levels for comprehension testing.

A second study (Venezky, Chicone, & Perry, 1976) explored the feasibility of on-line testing of letter-sound encoding with first, second, and third graders. The results of these studies were mixed. On the one hand, five of the nine patterns tested showed results similar to those obtained by standard testing procedures. On the other hand, limitations were found in the quality of the PLATO audio recordings and in the testing paradigm which was selected.

This final set of feasibility studies covers a variety of on-line techniques for assessing vocabulary knowledge, and at the same time provides some preliminary information on response-contingent testing. In addition, brief descriptions of all tests developed to date are given in Appendix A and an on-line bibliography of reading research literature is described in Appendix B. All development work was done at the R & D Center of the University of Wisconsin on a PLATO terminal which included a touch detection collar, audio unit, and printer. Testing for Studies 1 and 2 was done at Kennedy-King Community College in Chicago, Illinois.

II

STUDY 1

Study 1 examined the characteristics of three different approaches to vocabulary testing: self-screening, synonyms, and word matching under brief exposure (called "Timed Exposure" here). The Self-screening Test required subjects to indicate whether or not they thought they knew the meaning of a word. The Synonym Test required selection of a synonym for a word from among three alternatives, while the Timed Exposure Test required finding an exact match for a target word from among three alternatives.

In this last test the target word appeared for a brief period (e.g., 1/10 sec.), followed by a row of x's at the same location on the screen. Then after a brief delay (e.g., 1 sec.), the three alternatives appeared. The alternatives included an exact match plus two strings which were visually similar to the target. The major assumption upon which this paradigm was designed was that if the meaning of a word were not known (i.e., the word was not in the subject's sight-word vocabulary), matching would have to be by phonological form (via letter-sound translation) or by visual match. The brief exposure time was introduced to restrict phonological encoding while the delay before the alternatives was inserted to reduce the possibility of a visual match.

METHOD

The stimuli for the three different test paradigms are shown in Appendix C. The Self-screening Test had six different levels with eight items per level. The Synonym Test had seven different levels with ten items per level. The Timed Exposure Test had eight different levels with ten items per level. Words were selected from the Dolch lists (Dolch, 1951) and from the Johnson lists (Johnson, 1971) to cover typical reading vocabularies from grades one through eight. Each test level represented a single grade level or a combination of contiguous levels.

Subjects

One-hundred ten students from grades two, three, four, five, six, and eight of a single elementary school in Chicago, Illinois, participated in the study. However, because of a technical failure, the data for all

22 second-grade students were lost. The number of children in each grade and their scores on the Reading Comprehension component of the Iowa Tests of Basic Skills is shown in Table 1.

TABLE 1

NUMBERS OF SUBJECTS AND MEAN READING SCORES
BY GRADES FOR STUDY 1

Grade	N	Mean Reading Score	S.D.
3	19	3.108	.439
4	19	3.304	.524
5	12	4.650	.626
6	23	4.883	.695
8	15	5.246	.947

Procedure

Subjects were brought from their classroom to the testing site, which was approximately three blocks away, in class groups. The testing session began with a warm-up test which familiarized the subjects with the equipment and with the procedures for doing the three test formats. The warm-up was conducted by project staff members and consisted of a different set of items for each test format. These items were presented in the same manner as they would be during the actual testing. The average time to complete the warm-up was about seven minutes. Total testing time for each group, including the warm-up, ranged from about 25 minutes (some eighth graders) to about 40 minutes. Most of the testing sessions lasted about 35 minutes.

Each subject began the first test at a level of difficulty considered appropriate to his or her grade level. (See Table 2 for initial level.) After completing that level of the test, the subject was given a different level, determined by his or her score. Scoring 50 percent or less caused the level to drop by two; scoring more than 50 percent but less than 80 percent caused a drop of one level; scoring 80 percent or more increased the level by two. Three different levels of difficulty for each test format were given unless, prior to the third level, the subject mastered the highest level or failed the lowest level. When a test format was completed, the new test format was begun at the level one less than the highest level mastered on the previous format. If the resulting level was less than two, the level was reset to two.

The first test administered was the Self-screening Test. Subjects saw four words on the screen at one time and had to touch each word whose meaning they did not know. When a word was touched, a box appeared around it. A

TABLE 2

TEST ENTRY LEVELS FOR STUDY 1

Grade	Level At Which Subject Began Tests
2	2
3	2
4	3
5	4
6	5
8	6

second touch indicated that a mistake had been made and removed the box. After the set of four words had been inspected and the responses to each made, the subject pressed the "NEXT" key on the keyboard to see the next four items (or a new test format). There were six levels (1-6) in the Self-screening Test, Level 1 being the least difficult and Level 6 the most difficult.

The second test was the Synonym Test. Subjects were shown a sample word in a box near the top of the screen and four response words below it. The subject had to touch the word from the list below which was closest in meaning to the word in the box. Each subject began the test at the level of difficulty determined by his or her performance on the Self-screening Test. There were seven levels of difficulty within the Synonym Test, ranging from Level 1 (least difficult) to Level 7 (most difficult).

The third test in the series was the Timed Exposure Test. The subject saw an empty box in the middle of the screen; then a word appeared in the box and was replaced after a delay of .2 seconds by lower-case x's. After a two second delay, three words appeared below the box. The subject had to touch the word he or she thought was the same as the one that had appeared in the box. Each subject began the Timed Exposure Test at a level of difficulty determined by his or her performance on the Synonym Test. There were eight levels of difficulty within the Timed Exposure Test (1-8), Level 1 being the least difficult and Level 8 the most difficult.

RESULTS AND CONCLUSIONS

Since subjects took different tests depending upon their performances on previous tests, evaluation of the test results had to be based on relationships between tests, as well as on item analyses and observations made during the testing sessions. Figures 1, 2, and 3 show the relationships between test

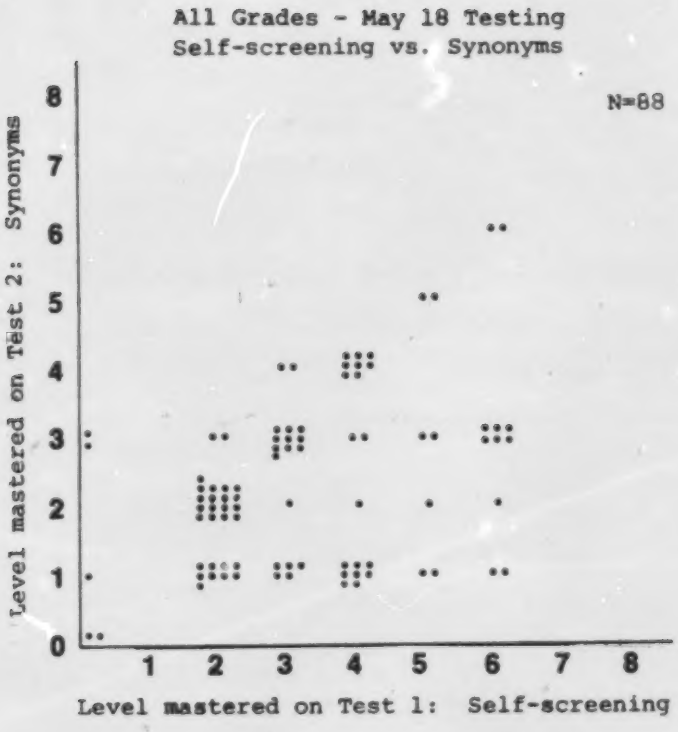
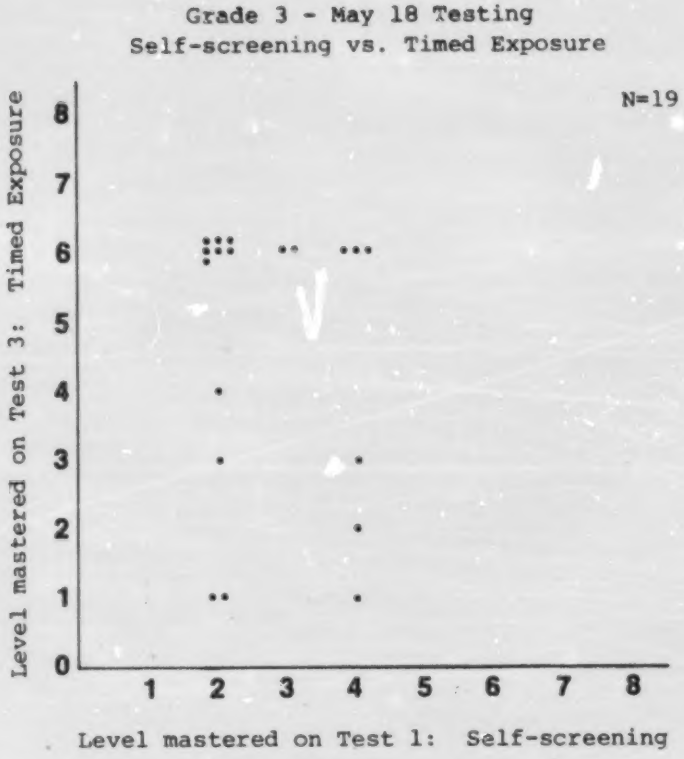


Figure 1. Self-screening vs. Synonyms--Study 1.



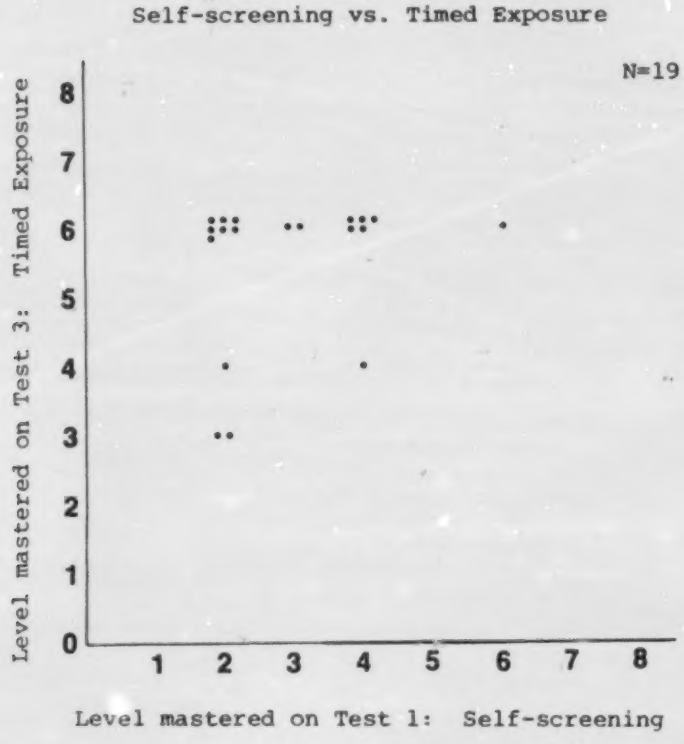
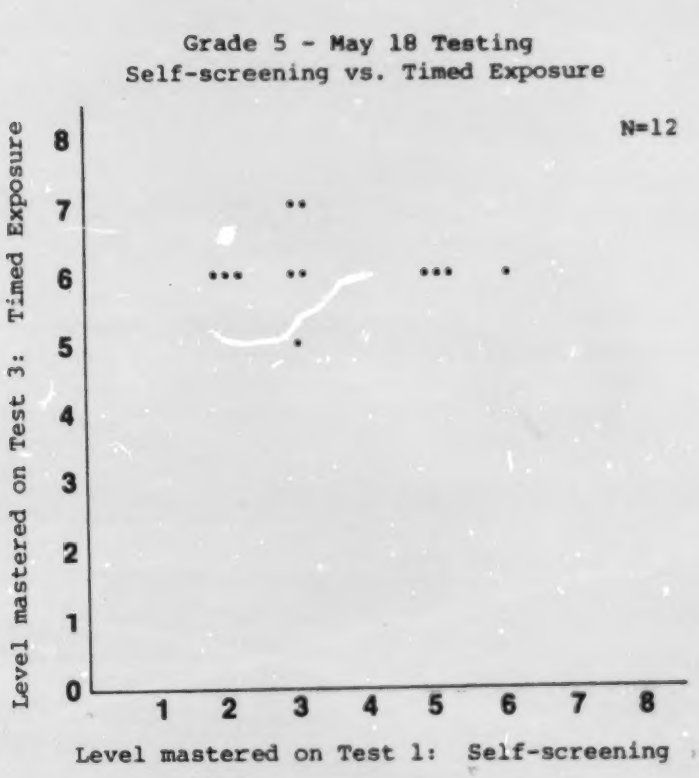


Figure 2. Self-screening vs. Timed Exposure--Study 1.


Grade 5 - May 18 Testing
Self-screening vs. Timed Exposure
N=12
Level mastered on Test 3: Timed Exposure
0 1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8
Level mastered on Test 1: Self-screening

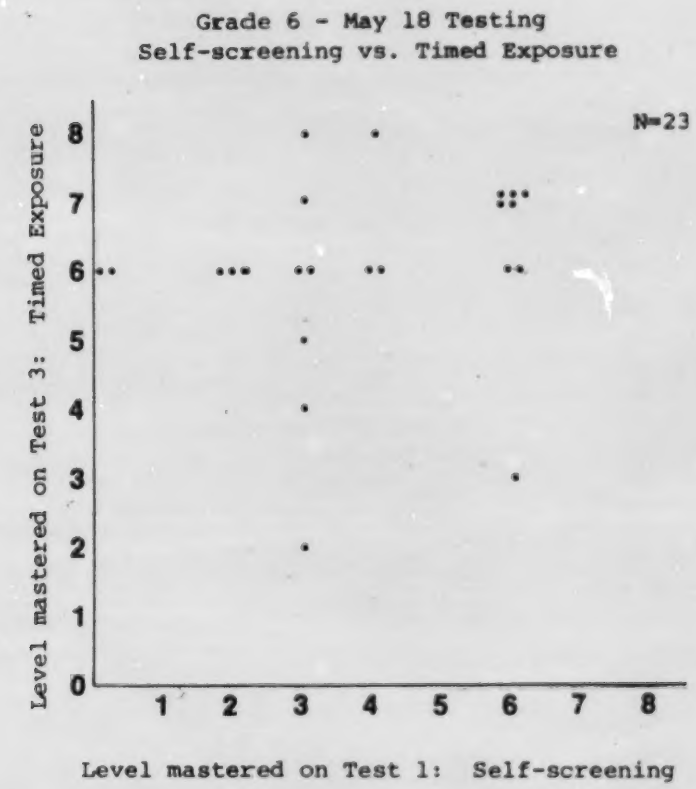

Grade 6 - May 18 Testing
Self-screening vs. Timed Exposure
N=23
Level mastered on Test 3: Timed Exposure
0 1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8
Level mastered on Test 1: Self-screening

Figure 2. Self-screening vs. Timed Exposure--Study 1 (cont.).

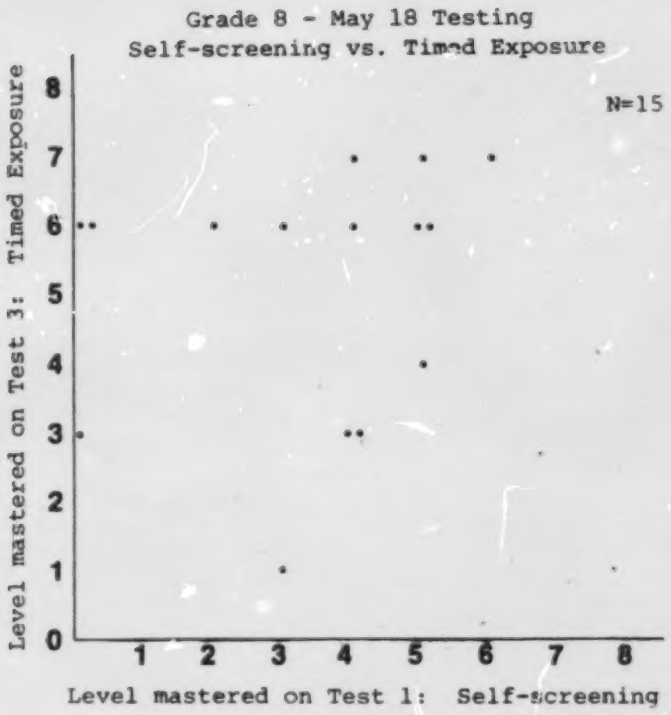
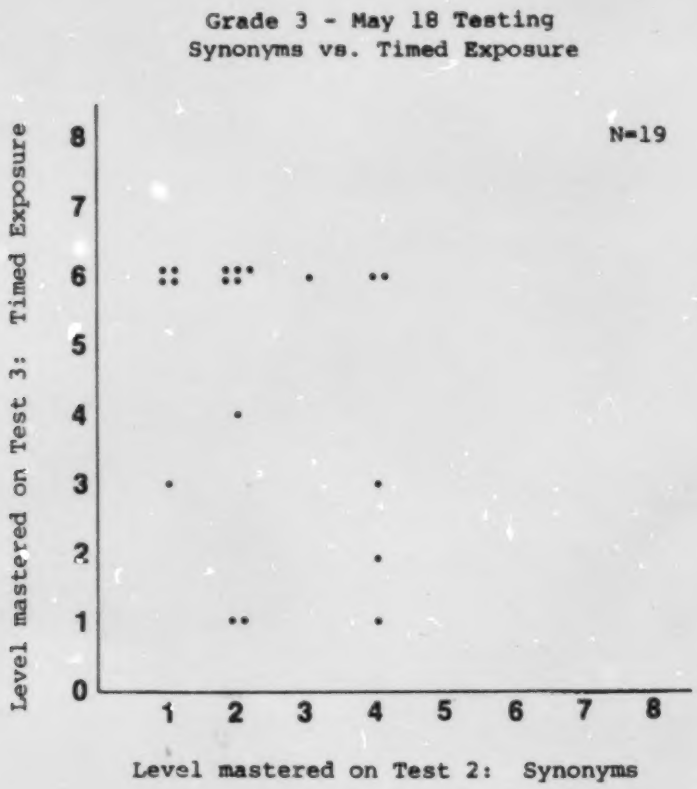


Figure 2. Self-screening vs. Timed Exposure--Study 1 (cont.).



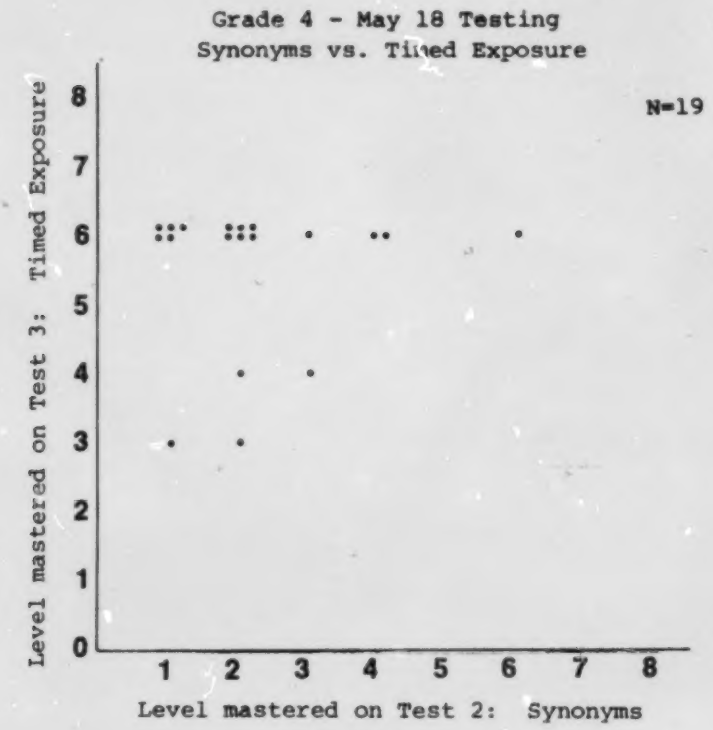
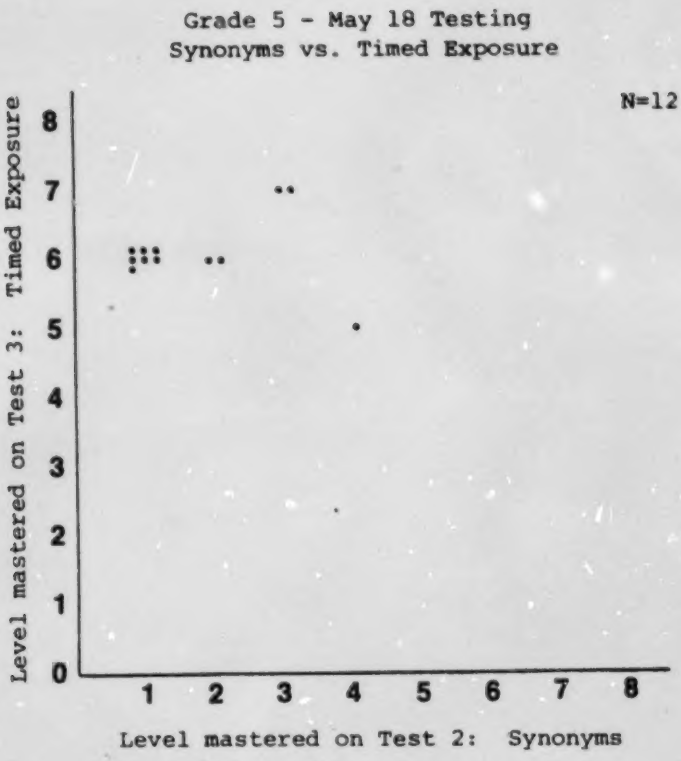


Figure 3. Synonyms vs. Timed Exposure--Study 1.


Grade 5 - May 18 Testing
Synonyms vs. Timed Exposure
N=12
Level mastered on Test 3: Timed Exposure
0 1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8
Level mastered on Test 2: Synonyms

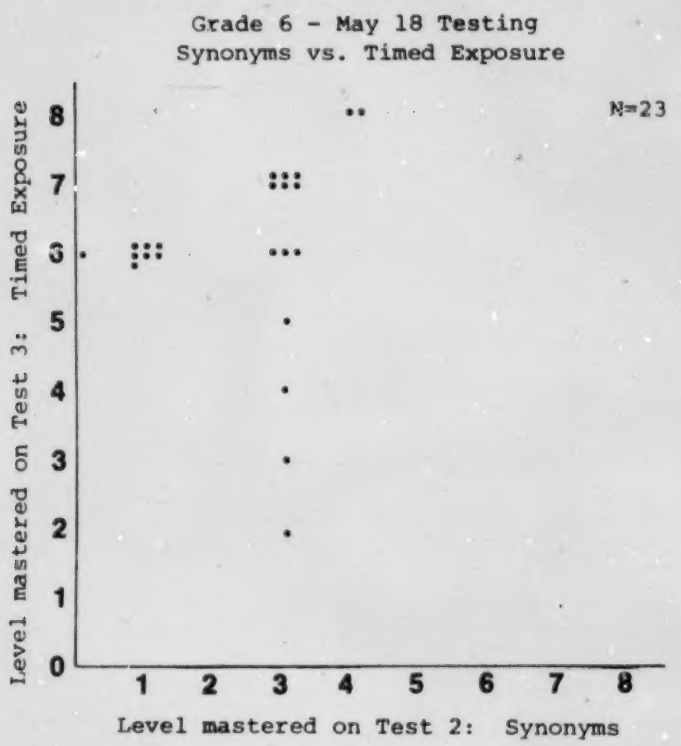

Grade 6 - May 18 Testing
Synonyms vs. Timed Exposure
N=23
Level mastered on Test 3: Timed Exposure
0 1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8
Level mastered on Test 2: Synonyms

Figure 3. Synonyms vs. Timed Exposure--Study 1 (cont.).

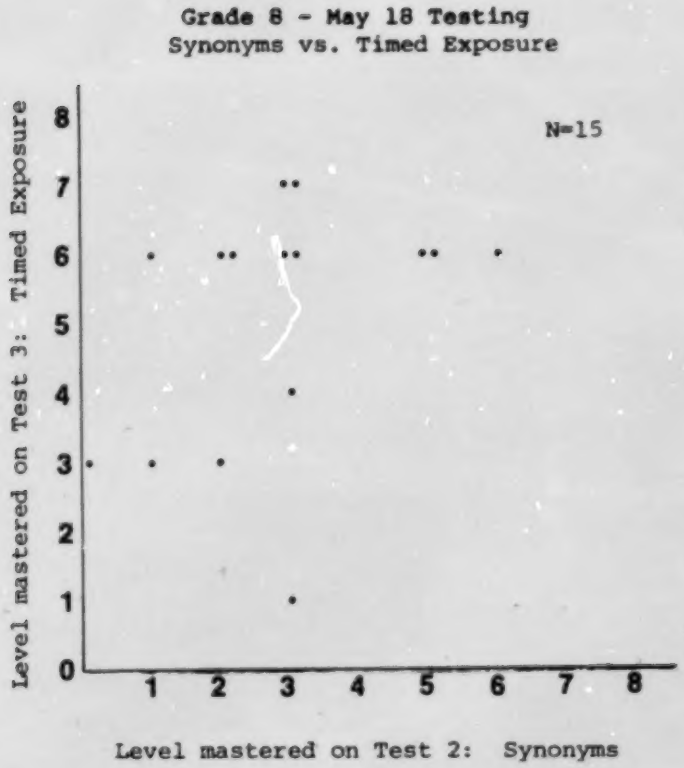


Figure 3. Synonyms vs. Timed Exposure--Study 1 (cont.).

pairs based on the highest level mastered for each test. Although there is a linear trend to these charts, the wide scatter indicates that either the tests are tapping widely different abilities which do not have the same age-development trends, or that some of the tests are unreliable.

Item analyses showed a wide variation of item difficulty within certain tests, especially those for the timed exposure paradigm. Based on these results, plus the observations of those who monitored the testing session, several changes were made to the tests and testing procedure.

Warm-up

Several changes were made in the warm-up items. First, lessons were added to the PLATO program to give subjects practice in touching a word to make a box appear and disappear. Second, modifications were made to give subjects more practice in pressing the NEXT key on the keyboard when the words "Press NEXT" appeared on the screen. These modifications included adding an additional display as well as changing the directions which told a subject to press NEXT so the directions were consistent in all tests. The directions for pressing NEXT were also changed in the corresponding tests, as the same program was used to present both warm-up and test items. Third, an additional set of items was added to the warm-up for the Self-screening Test to give subjects more practice in that format.

The Tests

Minor changes were made in each individual test format. The words "LOADING CHARACTERS," which appeared on the screen at the end of the first Self-screening Test to signal a delay due to the loading of characters, were replaced with the words "PLEASE WAIT " and the actual loading of characters was done before the first test. In addition to the changes described above to make the "Press NEXT" messages consistent in the second test, the box with the target word was moved farther down the screen to avoid some visibility problems occurring on some of the screens. (The visibility problems had not shown up on the screen during tests at the Research and Development Center.)

Some modifications of the third test were also felt to be necessary. Previously, subjects could not tell which answer they had touched because a box did not appear around their choice, as it did for the other two tests. A box was added to indicate to the subjects that their touch had registered and also to make the third test more consistent with the other two tests. A second change made in the third test was to move the three word choices farther below the target word box.

A third change decided upon for the third test was to vary for some groups the time between the showing of the target word and the masking of the word. Therefore, for all subjects in grades one and two and half of the subjects in grade eight the delay was set for .05 seconds, while for the seventh graders and the other half of the eighth graders the delay was set at 0 sec. and .1 sec. respectively.

III

STUDY 2

METHOD

Stimuli

The stimuli were the same as in Study 1, with modifications to the warm-up items as described above.

Subjects

Ninety-five students from grades one, two, seven, and eight were tested. All were selected from the same school used in Study 1. (The group of second graders tested was the same group whose data were not properly stored during Study 1.) Mean reading scores from the Reading Comprehension component of the Iowa Test of Basic Skills for each grade level are shown in Table 3.

TABLE 3

NUMBERS OF SUBJECTS AND MEAN READING SCORES BY GRADES FOR STUDY 2

Grade	N	Mean Reading Score	S.D.
1	20	2.633	.839
2	16	2.839	.426
7	21	7.425	1.254
8a	18	4.479	2.082
8b	19	8.246	1.281

Procedure

Testing was performed approximately one week after testing for Study 1. The procedure was primarily the same as it was for Study 1,

except that the time for the warm-up items, because of the additions described above, was increased from about seven minutes to about nine minutes. In addition, each subject began all three tests at a level of difficulty appropriate to his or her grade level. (See Table 4 for details.) Average testing time was about 35 minutes with the exception of the first grade testing which took 55-60 minutes.

TABLE 4

TEST ENTRY LEVELS FOR STUDY 2

Grade	Level At Which Subjects Began Tests
1	1
2	2
7	4
8	4

RESULTS

Almost all subjects in grades one and two scored at or near zero for all three tests. Therefore, these students were excluded from further analyses. Scatter plots for each test pair for grades seven and eight separately are shown in Figures 4, 5, and 6. From these charts it can be seen that although the synonym and self-screening paradigms produce a wide range of scores, the timed exposure paradigm showed a ceiling effect.

Correlations between test pairs (uncorrected for attenuation) for grades seven and eight combined varied from .67 (Synonyms, Timed Exposure) to .44 (Self-screening, Timed Exposure).

CONCLUSIONS

From the results of the two studies reported here, two additional pilot tests were designed. The first, which is reported in the next section, examines the validity of the timed exposure paradigm. The score distributions produced by this test are not normally distributed, nor do they, in spite of some relatively high correlations, vary directly with performance on a standard vocabulary paradigm (synonyms).

The second test, which is still being developed, will compare the self-screening and synonym (out of context) paradigms to three other

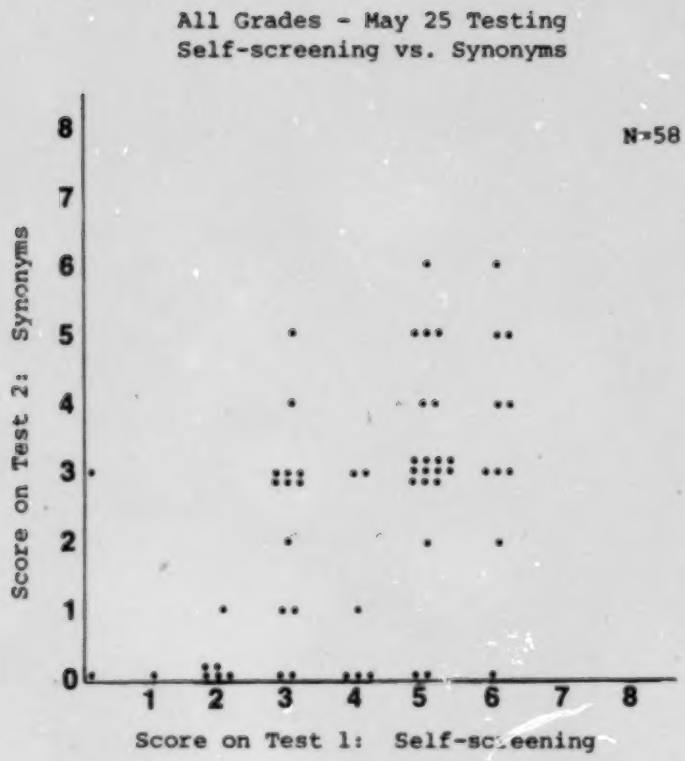
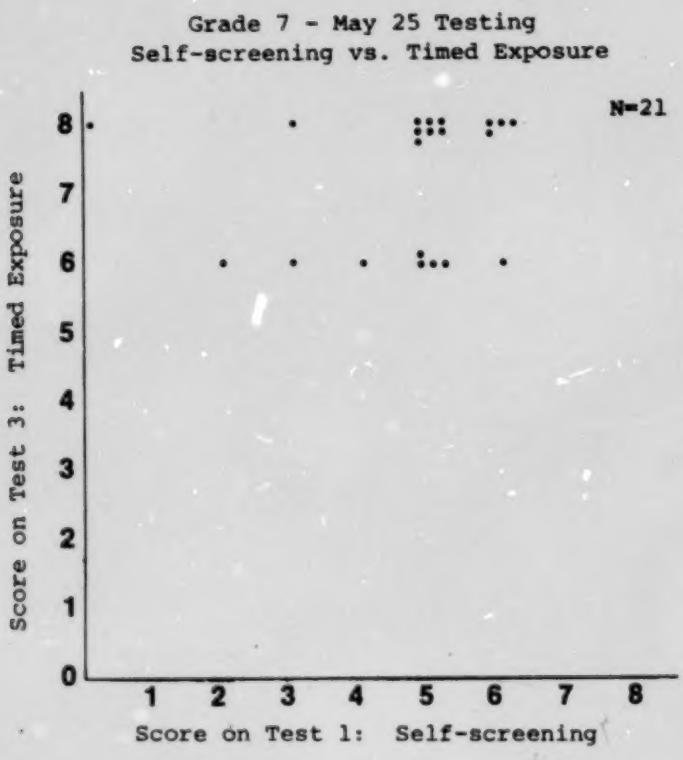


Figure 4. Self-screening vs. Synonyms--Study 2.



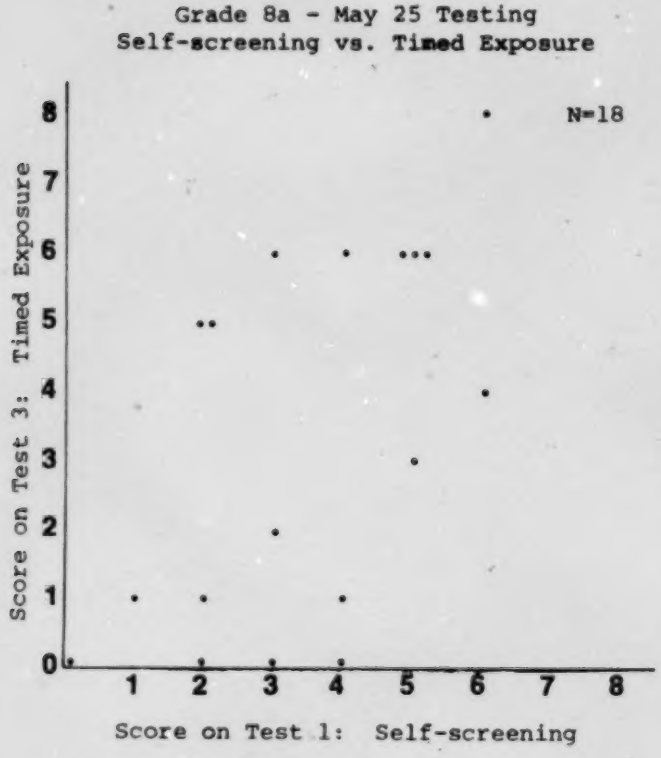


Figure 5. Self-screening vs. Timed Exposure--Study 2.

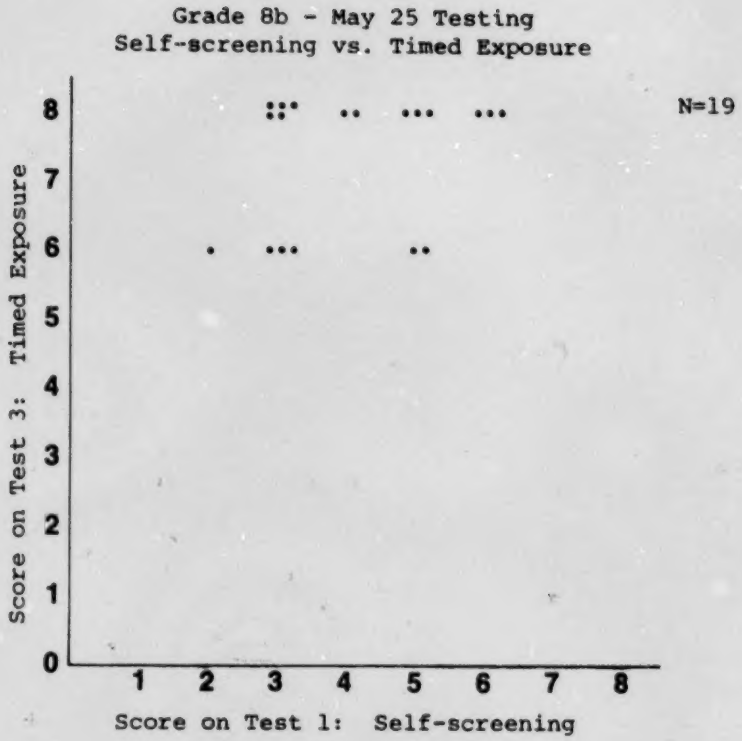
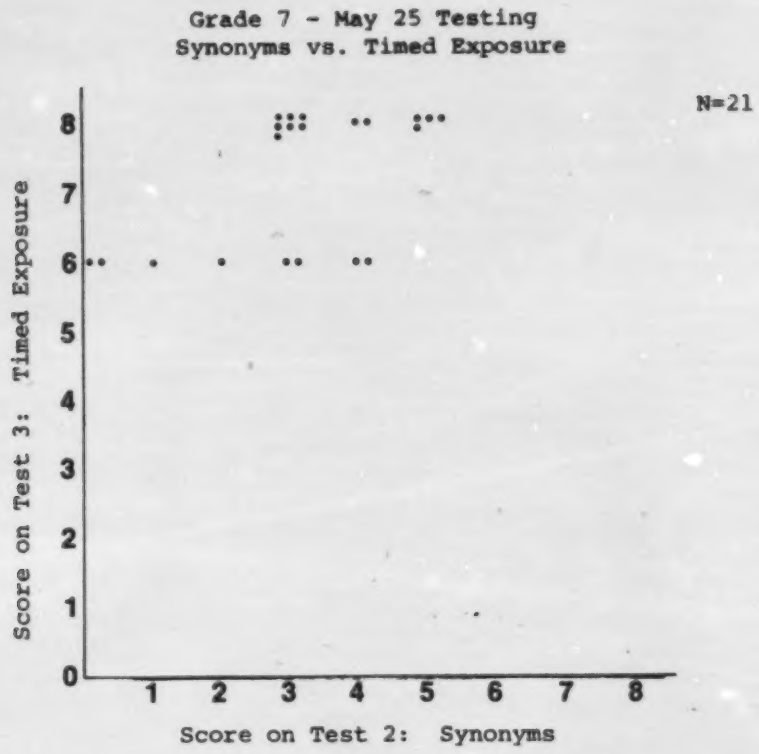


Figure 5. Self-screening vs. Timed Exposure--Study 2 (cont.).



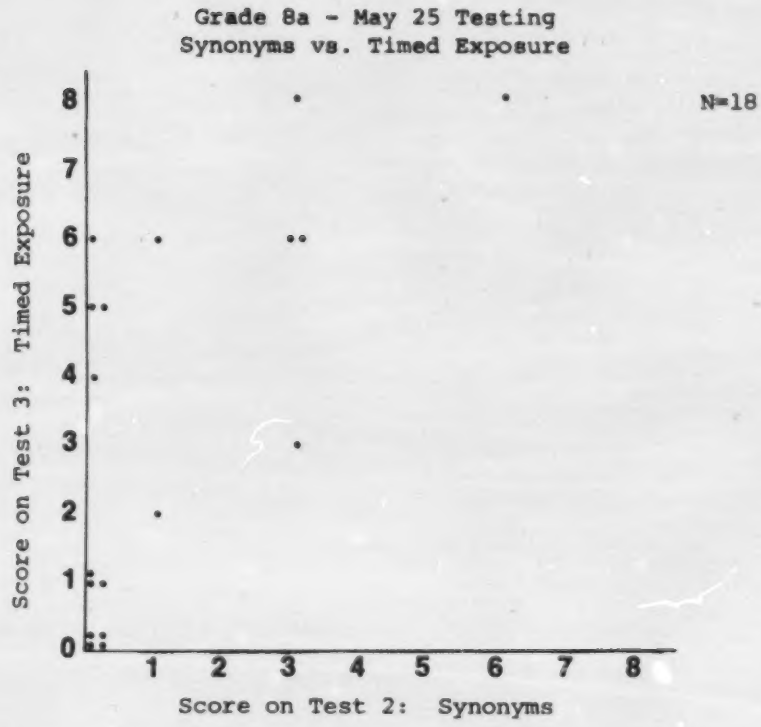


Figure 6. Synonyms vs. Timed Exposure--Study 2.

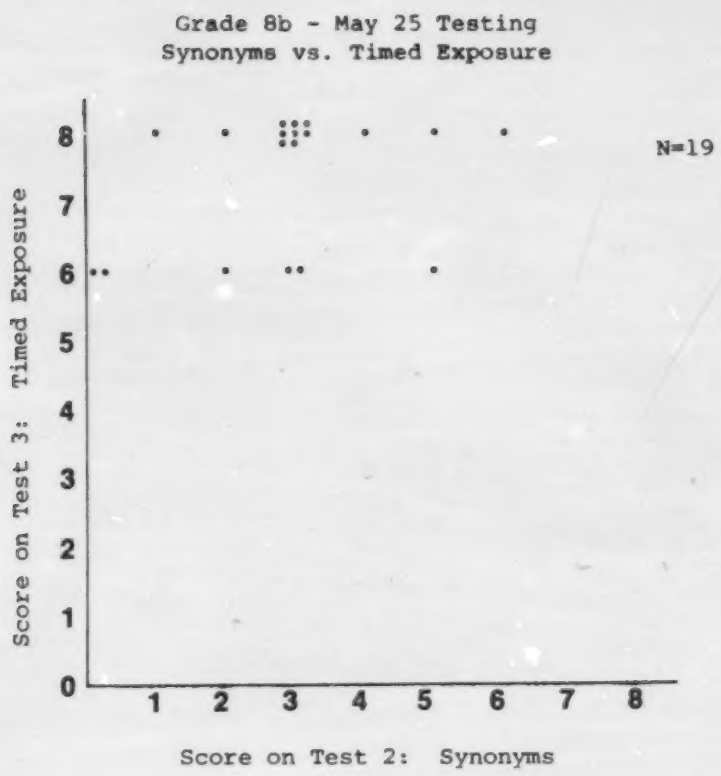


Figure 6. Synonyms vs. Timed Exposure--Study 2 (cont.).

vocabulary paradigms: synonyms in context, multiple-choice cloze, and word identification (multiple choice) with orally presented target words.

IV

STUDY 3

INTRODUCTION

The rationale for the Timed Exposure Test was that if a target word were presented sufficiently briefly, a subject who did not know the word (i.e., did not have the word in his or her sight word vocabulary) would have difficulty mapping the word into sound. Furthermore, with a sufficient delay between the offset of the target word and onset of the alternatives, a visual image could not be retained accurately. Thus, the subjects who could match a target word to an internal representation, that is, who could recognize the word, would have an advantage in such a task. If by proper manipulation of exposure and delay times these conditions could be shown to hold, then a quick and efficient word recognition paradigm would result. However, the results of the two studies just described cast considerable doubt on the validity of this test. The experiment for Study 3 was constructed to give a direct test of the assumptions behind the paradigm.

METHOD

Stimuli

Two sets of 20 synthetic words each were prepared. Each set contained four items of each string length from three to seven letters. The sets differed only in that one contained only pronounceable items and the other, only unpronounceable items. Associated with each item in each set were three response alternatives of the same length and pronounceability. One alternative was an exact match of the target; the other two were visually similar to the target. In addition to the two sets of synthetic words, the ten real words with real word alternatives were taken from the eighth grade vocabulary list. All stimuli are shown in Appendix D.

Subjects

Twenty-five subjects from a graduate education course at the University of Wisconsin participated in the study.

Procedure

The study was conducted on the PLATO terminal at the Wisconsin Research and Development Center for Cognitive Learning. Each subject responded to

the list of real words first and then to the two synthetic word lists with the order of the latter two lists randomly assigned. The real words were preceded by four (real word) warm-up items, the synthetic lists by five synthetic warm-up items, of the same pronounceability type as the items in the list.

In each trial the target word appeared for either 1/60th or 1/30th of a second, followed as quickly as possible by a mask of x's. One second after the mask appeared, the alternatives were displayed, centered in a row beneath the target display position. Fourteen of the subjects received all three lists at an exposure time of 1/60th sec.; 11 received the lists at an exposure time of 1/30th sec. For a discussion of the reliability of these exposure times, see Appendix E.

RESULTS AND CONCLUSIONS

The means for real and synthetic words at each exposure duration are shown in Table 5. The means for each word length for synthetic words are shown in Table 6.

TABLE 5

PERCENTAGES CORRECT FOR EACH EXPOSURE TIME--STUDY 3

Exposure Time	N	$\bar{X}$real	$\bar{X}$pron	$\bar{X}$unpron
1/60 sec	14	92.9	79.3	56.4
1/30 sec	11	90.0	83.2	66.8

TABLE 6

PERCENTAGES CORRECT FOR EACH
STRING LENGTH--STUDY 3

		String Length				
Exposure Time	Pronounce-ability	3	4	5	6	7
1/60	Pron.	91.3	85.8	80.3	76.8	62.3
	Unpron.	64.5	71.3	57.0	44.8	44.8
1/30	Pron.	100.0	97.8	75.3	75.0	68.5
	Unpron.	88.8	79.8	57.0	52.3	52.5

Independent t-tests were performed on each set of responses for synthetic words, under the assumption that the population mean for each list type was chance performance level, i.e., that $u = 6.67$. The results, shown in Table 7, led to the rejection of the null hypotheses in each case at a significance level less than .005.

Conclusions

The results show clearly that performance levels on the synthetic words were significantly different from chance. Whether this was due to the inability of the PLATO terminal to display letter strings briefly enough or to faulty initial hypotheses cannot be determined from Study 3. The conclusion to be drawn, however, is that the timed vocabulary paradigm on the PLATO system is not valid for measuring vocabulary ability.

TABLE 7

t-test VALUES FOR STUDY 3

	$\bar{X}$	Sm	*t*	d.f.	*p* <
1/60 pron.	15.86	0.52	17.67	13	.005
1/60 unpron.	11.29	0.52	8.90	13	.005
1/30 pron.	16.64	0.530	17.80	10	.005
1/30 unpron.	13.18	0.783	8.31	10	.005

REFERENCES

Dolch, E. W. Psychology and teaching reading. 2nd ed. Champaign, Ill.: Garrard Press, 1951.

Johnson, D. D. A basic vocabulary for beginning reading. The Elementary School Journal, 1971, 72, 29-34.

Venezky, R., Bernard, L., Chicone, S., & Leslie, R. On-line diagnosis of reading difficulties. Technical Report No. 327. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1975.

Venezky, R., Chicone, S., & Perry, J. On-line diagnosis of reading difficulties-II. Technical Report No. 386. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1976.

APPENDIX A

SUMMARY OF AVAILABLE TESTS

SUMMARY OF AVAILABLE TESTS

The tests which are described in the following pages are accessible on any PLATO terminal attached to the University of Illinois PLATO System through lesson uwindex (for those who have their own PLATO records), or through record index in course uw. The attempt was not made in this lesson to simulate the audio recording for those tests that use this feature, nor are responses stored by the PLATO system.

Following the description of each test is a reproduction of a portion of the test. (The reproduction process introduced extraneous dots and blotches which do not appear on the PLATO screen.)

THE

WISCONSIN

DIAGNOSTIC

READING TEST

INDEX

MAIN INDEX

Pre-reading Skills Test -- Visual

a. Letter Order, Letter Orientation, Word Detail

Letter-sound Tests

b. Same/different

c. Triple Choice

d. Wordsort

Vocabulary Tests

e. Self-screen

f. Synonym

g. Timed Exposure

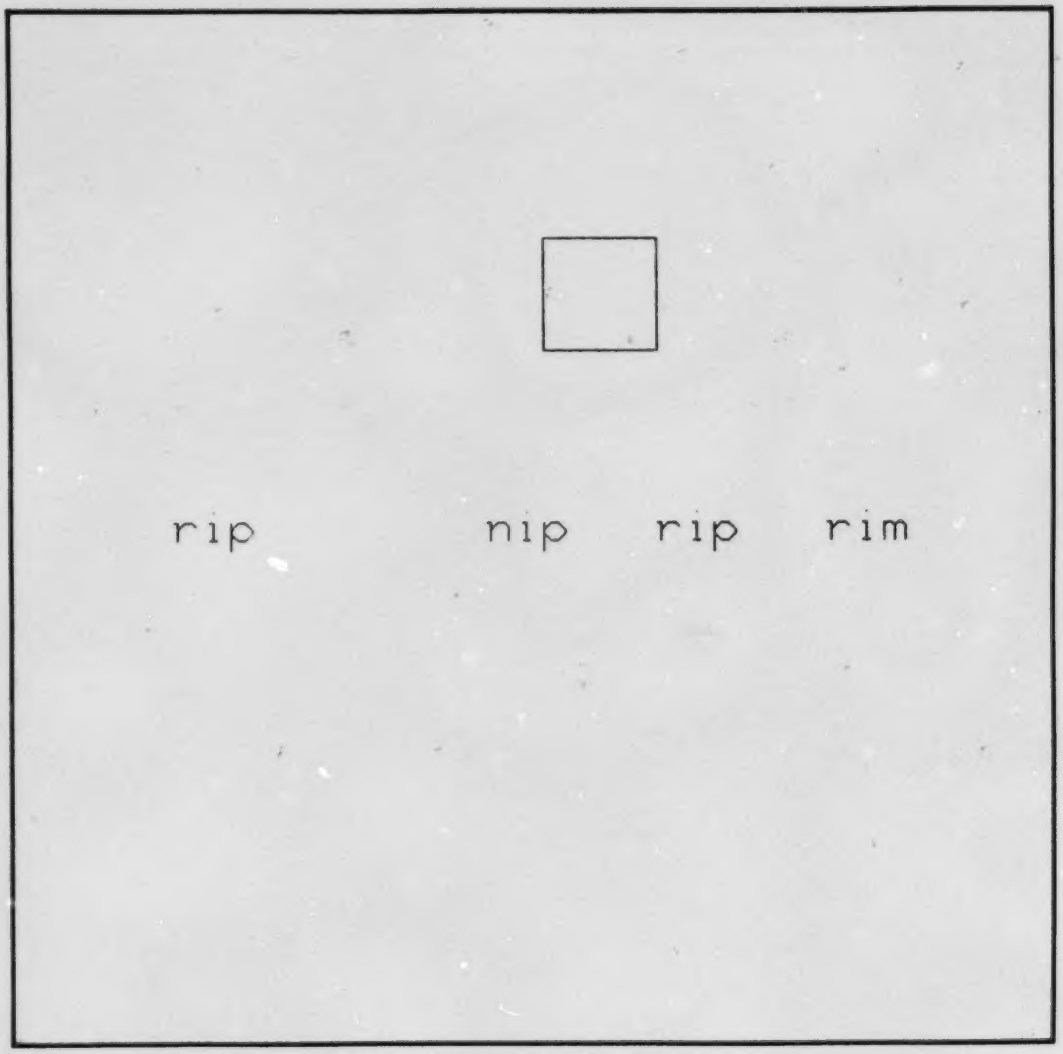
h. Cloze-synonym

i. Context-synonym

Pre-reading Skills Test

Visual Tests

This paradigm tests children's acquisition of three visual skills: attending to letter order, attending to letter orientation, and attending to word detail. All tests use a multiple-choice format. The target letter(s) appear at the left side of the screen, followed by three alternative responses. The child is told to touch the letter(s) on the right that "look just like" the one(s) on the left. The touched choice is circled and the child may touch it again to go on to the next item, or may touch a different choice to change his or her answer.

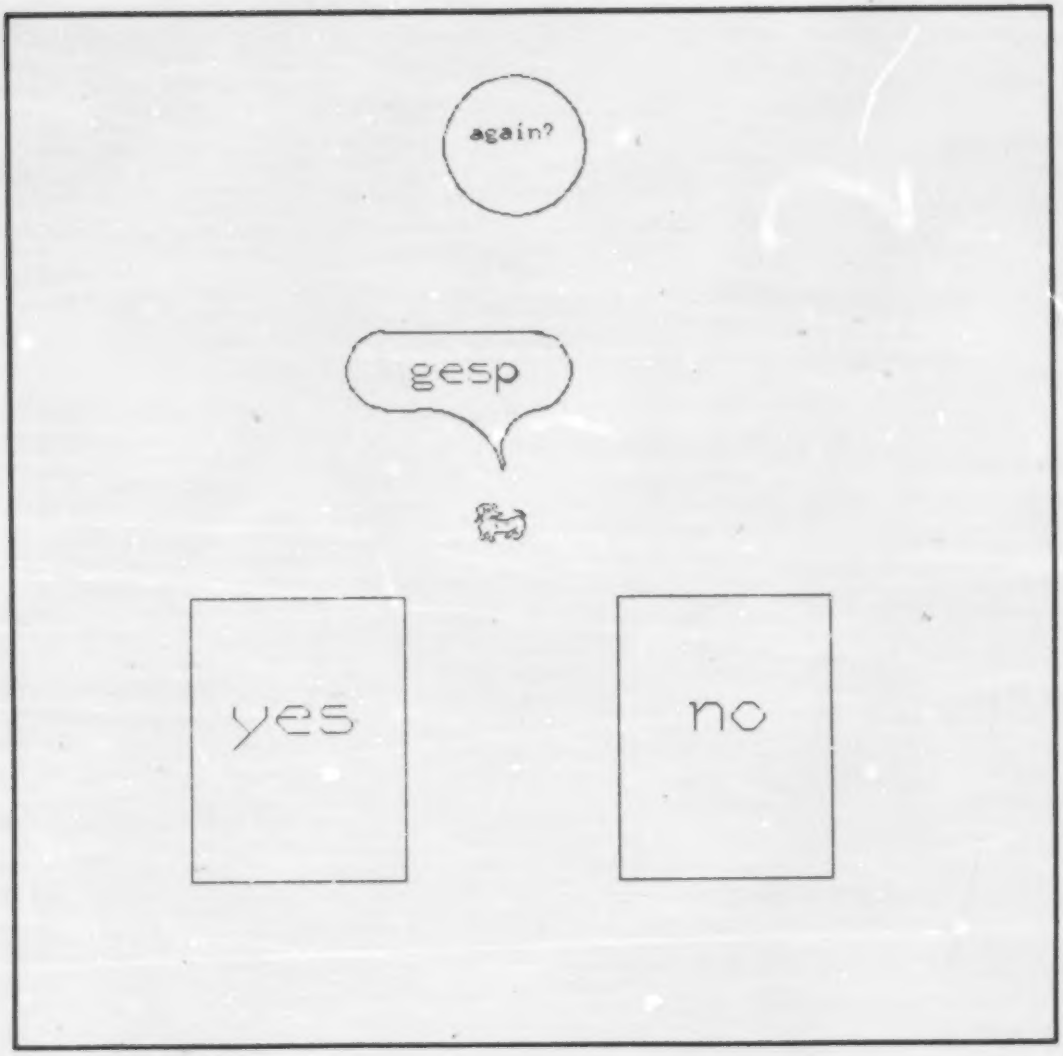


40

Letter-sound Test I

Same/Different

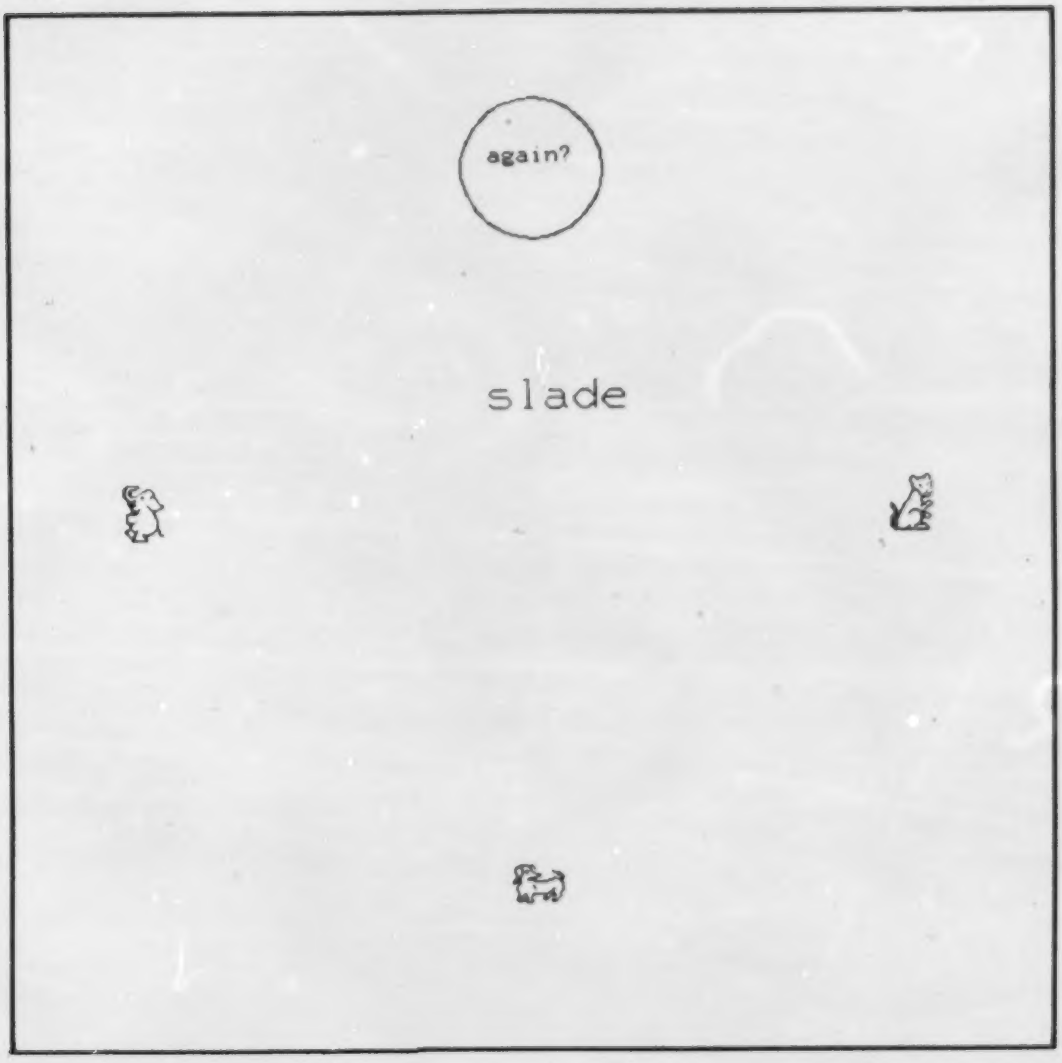
This paradigm tests children's acquisition of six letter-sound correspondences: long and short "a," soft and hard "g," and soft and hard "c." For each test item, one of three animals (a dog, an elephant, or a lion) appears on the screen. A target word then appears above the animal and the child is told the way the animal would pronounce the word. The pronunciation given is either the correct or the incorrect alternate pronunciation (i.e., long instead of short "a"). The child is to touch either the "yes" or "no" box at the bottom of the screen, depending on whether or not he or she agrees with the animal's pronunciation. A box then appears around this choice. The child has the option either of touching the same choice again to go on, or of changing the choice by touching the other box. The child can hear the word pronounced again at any time by touching the circle at the top of the screen.


again?
gesp
yes
no

Letter-sound Test II

Triple Choice

This paradigm tests children's acquisition of six letter-sound correspondences: long and short "a," soft and hard "g," and soft and hard "c." For each test item, three animals (a dog, an elephant, and a lion) each pronounce the target word which appears near the middle of the screen. One pronunciation is very different from the proper pronunciation of the target word, a second is close (i.e., long "a" for short "a"), and a third is the correct pronunciation. The child is to touch the animal that said the word correctly. A box then appears around the touched animal. The child may then touch the same animal again to go on to the next item, touch a different animal to change his or her answer, or request a repetition of the pronunciations by touching the circle near the top of the screen.

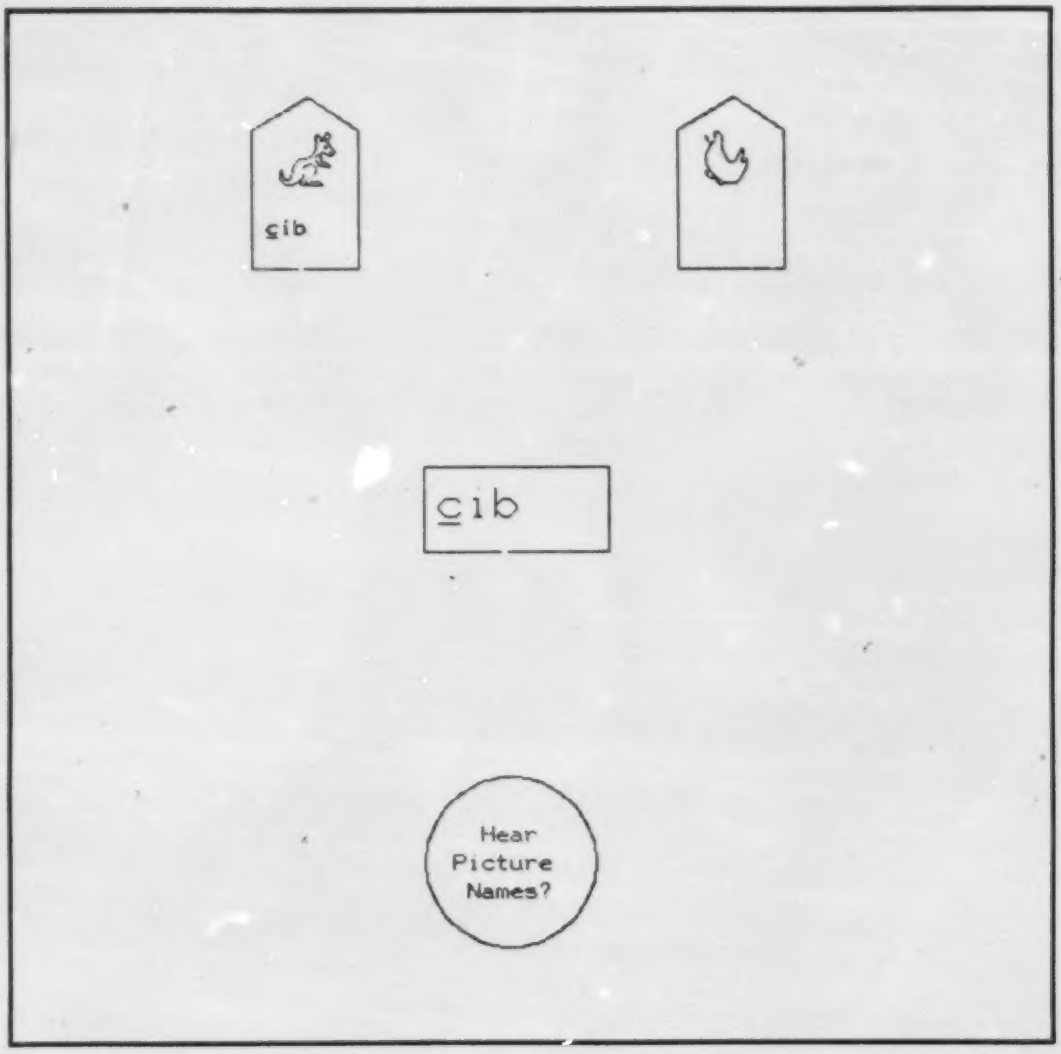


41

Letter-sound Test III

Wordsort

This paradigm tests children's acquisition of ten letter-sound correspondences: hard and soft "c," and the long and short sound for the vowels "a," "e," "i," and "o." For each test item, a word with the target letter underlined appears near the middle of the screen. At the top of the screen are two houses, each containing a picture of a common object. Each picture name contains one of the two alternative sounds for the target letter. (For example: pictures of a cat and a cake appear for the long and short "a" items.) The child must touch the object whose name contains the same sound as the sound made by the target letter. When the child touches an object, the word moves from the middle of the screen into the house which surrounds the object. The child has the option of touching the object again to see the next item, or of touching the other object to change the answer. The names of the objects in the houses are repeated whenever the circle at the bottom of the screen is touched.


cib
cib
Hear
Picture
Names?

Vocabulary Test I

Self-screen

This paradigm asks children to select from a group of words those whose meanings are unknown. The items are presented four at a time; the child must touch those words whose meaning he or she doesn't know. A box then appears around each word that is touched. A second touch removes the box from the word, in case a mistake is made. To see the next set of items, the child must press NEXT.

Touch the words whose meaning you DON'T know.

admire stable

weave remain

If you know the meaning of all the words, press NEXT.

Vocabulary Test II

Synonym

This paradigm tests children's knowledge of vocabulary words by means of synonyms. For each item a stimulus word is presented and the child is asked to touch, from four choices, the word which is closest in meaning to the stimulus word. A box then appears around the word that was touched. The child is then given the option of touching a different word to change his or her answer or pressing NEXT to see the next item.

Touch the word which is closeat in meaning
to the word in the box.

briskly

awkwardly | sadly | rapidly | slowly

If you are finished, press NEXT.

OP, to change your answer touch another word.

Vocabulary Test III

Timed Exposure

This paradigm tests children's ability to encode words of varying length. For each test item the stimulus word is flashed in a small box on the screen and then replaced by a string of x's. Three words then appear, one of which was the stimulus word. The child is asked to touch the word that is the same as the one he or she saw in the box. When a word is touched, a box appears around it. The child is then given the option of changing the answer or pressing NEXT to see the next item.

xxxxxxxxxx
bar
fan
far
If you are finished, press NEXT.
OR, to change your answer touch another word.

Vocabulary Test IV

Cloze-synonym

This paradigm tests children's knowledge of vocabulary words by means of a cloze procedure. For each item a sentence with a blank line in place of one of the words is placed on the screen. Four words appear below the sentence. The child is asked to touch the word that best completes the sentence. A box appears around the child's choice. The child is then given the option of touching a different word to change his or her answer or pressing NEXT to see the next item.

Touch the word which best completes the sentence.

The horse trotted _____ along a familiar path.

after below twelve briskly

If you are finished, press NEXT.

OR, to change your answer touch another word.

Vocabulary Test V

Context-synonym

The paradigm tests children's knowledge of vocabulary words by means of synonyms. For each item a sentence with one word underlined appears on the screen. Four words appear below the sentence. The child is asked to touch the word that has the same meaning as the underlined word. A box appears around the child's choice. The child is then given the option of touching a different word to change his or her answer or pressing NEXT to see the next item.

Touch the word which is closest in meaning to the underlined word.

The feeble old dog walked beside the woman.

funny | weak | strong | fleet

If you are finished, press NEXT.

OR, to change your answer touch another word.

APPENDIX B

BIBLIOGRAPHY OF READING RESEARCH

Introduction

The Wisconsin Reading Research Bibliography was begun in 1965 as a card file bibliography of entries maintained by the Early Reading Skills Project of the Wisconsin Research and Development Center for Cognitive Learning. The bibliography originally was focused on prereading and early reading skills, but has been expanded over the past four years to include research literature on reading processes. By 1975 when the bibliography was converted to a PLATO lesson, it included over 800 entries.

Three services for the general PLATO users are now provided: browsing through the entries, viewing the most recently entered entries, and a notes capability for entering suggestions for new entries and comments about the lesson.

Access Procedure

Access for persons who do not have PLATO author or instructor records is through the record burr, the Bibliography of (uv) Reading Research; the PLATO course is uw. No password is required. Access for PLATO authors or instructors who choose to use their own records is through lesson burr.

Description of Entries

Bibliographic entries are stored in a data set, each block of which can contain about 25 entries, the exact number depending on the length of the individual entries in the block. The entries are standard bibliography

entries. One block is reserved for index information. As the bibliography grows, more blocks can be added, up to a maximum of 100, which is enough space for over 22,000 entries.

The editor for the entries is modeled after the Tutor source code editor, except that the Tutor source code editor is line oriented, while the bibliography editor is entry oriented first, then line oriented within entries. Persons with edit privileges may create new blocks and transfer entries from block to block until all blocks have approximately the same amount of space available for new entries.

Using the lesson

Persons who do not have edit privileges have access to all blocks in an "inspect only" browse mode. Access to a block is obtained by typing the number of the block at the arrow on the index page. While in a block, a browser has the following options:

press the space bar	to see more entries, until the page is full
press NEXT	to see a new page
type N	to see entry number N
press BACK	to return to the index page

From the index page a browser may enter the "insert block" by typing i and pressing NEXT. In this block a browser may, in addition to the options above, type i, again, and have an opportunity to enter a suggestion for an entry or a comment on the lesson or its content.

Persons who have edit privileges may use all of the above functions.

In addition they can edit the data structure with the following options.

Type	To
sN	save entry N in the save buffer
aN	append entry N to the present save buffer
isN	insert contents of the save buffer after entry N
rN	replace entry N with corrected version (line by line, used for small changes)
mN	modify entry N (allows for the justification of lines)
dN	delete entry N
p	print the contents of the save buffer

(The "p" option is currently implemented only for the Centronix printer at the Wisconsin Research and Development Center.)

APPENDIX C

STIMULI FOR STUDIES 1 AND 2

Self-screen Test

Level 1	Level 2	Level 3
first	nothing	invite
keep	street	raise
come	believe	scratch
right	start	arrive
seen	should	package
mother	only	plow
here	called	accident
said	thing	anchor

Level 4	Level 5	Level 6
remain	miracle	typical
shrug	weird	essential
flicker	sprawl	associate
weave	title	pottery
admire	insult	parcel
stable	panic	annoy
doubted	delegate	efficiency
marvel	suggestion	jolt

Synonym Test

Level 1

Stimulus	Responses			
red	pink	blue	gold	hard
look	peek	take	give	from
little	small	big	long	twice
get	receive	push	give	both
run	jog	stop	walk	side
like	enjoy	hate	bump	try
stop	end	start	go	walk
today	now	soon	then	song
over	above	below	with	art
after	later	send	before	play

Level 2

Stimulus	Responses			
pail	seat	jar	bucket	stairs
capture	hurt	kill	tense	catch
middle	edge	side	center	top
glance	swim	dash	look	fear
dive	cash	die	play	eat
gain	decrease	increase	lose	remain
injure	encourage	help	kinder	hurt
bound	dirty	tied	small	strong
rich	wealthy	poor	selfish	rapid
stone	rock	mill	round	heavy

Synonym Test

Level 3

Stimulus	Responses			
amazed	fearful	sure	sorrowful	surprised
alarmed	shy	silent	frightened	sleepy
satisfied	bored	brave	stubborn	pleased
stale	old	fresh	dull	sharp
glistening	shiny	depressing	expensive	cozy
shiver	tremble	scramble	worry	faint
clumsy	clever	capable	awkward	graceful
permit	prove	allow	forbid	object
simple	plain	weak	loose	base
eldest	youngest	oldest	smallest	smartest

Level 4

Stimulus	Responses			
briskly	slowly	sadly	rapidly	awkwardly
feeble	weak	funny	fleet	strong
hesitate	pity	provide	pounce	pause
gigantic	huge	minute	size	narrow
concealed	famous	displayed	hidden	peaceful
pauper	helpless	unhappy	poor	lost
confident	careful	sure	fearful	hesitant
menacing	inspiring	regular	slinking	dangerous
obvious	evident	crazy	unsure	forgive
pursued	punished	chased	helped	caught

Synonym Test

Level 5

Stimulus	Responses			
loyal	playful	faithful	mean	curious
surprised	expected	loyal	beguiled	startled
possess	accept	borrow	own	please
sheer	thin	heavy	bulky	thick
donor	seller	buyer	hoarder	giver
profit	prove	split	give	gain
bewildered	dull	sensible	confused	disgusted
scornful	disdaining	humble	modest	courteous
congested	large	crowded	dark	disorderly
proprietor	customer	salesman	bookkeeper	owner

Level 6

Stimulus	Responses			
conclude	begin	end	continue	postpone
scarlet	heavy	soft	red	neat
shortened	extended	unabridged	renewed	reduced
trap	snare	snap	lure	bait
vague	indefinite	wise	long	clear
chaotic	enviable	orderly	disfigured	confused
enlarge	distorted	exhorted	orated	distressed
twisted	lenient	strict	short	moderate
rigorous	bedlam	gaiety	solitude	sobriety
uproar	compact	refine	amplify	condense

Synonym Test

Level 7

Stimulus	Responses			
bough	top	branch	truck	bottom
initiate	start	disguise	produce	despair
flora	soil	plants	animals	air
awkward	manageable	big	clumsy	smelly
myth	money	legend	god	fog
blimp	cripple	fraud	airship	heal
forecast	predict	describe	dislike	before
gondola	food	boat	clothing	desk
encounter	fight	meet	serve	leave
broken	mutilated	remedied	deprived	manic

Timed Exposure

Level 1

Stimulus	Responses	
the	they	them
in	is	as
that	what	three
it	if	at
are	and	art
have	help	five
can	car	man
if	it	of
will	well	sell
about	above	shout

Level 2

Stimulus	Responses	
him	her	hit
more	move	make
see	she	six
no	on	an
only	ounce	holy
long	lone	song
me	we	be
go	do	got
much	muck	such
good	gave	going

Timed Exposure

Level 3

Stimulus	Responses	
look	like	book
small	swash	stall
big	pig	bag
never	near	ever
own	one	down
show	shop	flow
together	tongue	gather
got	gut	hot
keep	keen	beep
light	laugh	night

Level 4

Stimulus	Responses	
kind	kick	hind
far	fan	bar
try	tree	dry
today	toady	delay
better	butter	button
cut	cat	rut
top	too	hop
draw	drew	straw
done	dome	lone
red	bed	run

Timed Exposure

Level 5

Stimulus	Responses	
grow	grove	throw
hot	hat	lot
ten	tin	den
hold	hole	sold
full	fall	bull
start	star	smart
shall	shaft	small
bring	break	string
carry	carpet	marry
fall	farm	hall

Level 6

Stimulus	Responses	
seven	sewer	oven
eight	either	sight
sit	sat	fit
clean	clear	glean
myself	mystery	himself
pick	pack	sick
hurt	hurl	shirt
drink	drive	rink
thank	think	tank
service	servile	caprice

Timed Exposure

Level 7

Stimulus	Responses	
laugh	lunch	cough
creature	creation	armature
dissolve	dissipate	resolve
visual	visitor	casual
booth	book	tooth
gracious	graceful	veracious
throttle	throstle	brittle
filtered	filthy	lettered
carbide	carbon	abide
ignite	ignoble	granite

Level 8

Stimulus	Responses	
petty	pretty	jetty
manifest	manifold	methodist
lather	leather	rather
rapture	rapport	capture
sycamore	sycophant	sagamore
skirmish	skittish	stylish
phonetic	phoneme	kinetic
orient	origin	client
nimbus	nimble	omnibus
joist	joint	hoist

APPENDIX D

STIMULI FOR STUDY 3

Real Words Stimuli

target	distractors	
petty	pretty	jetty
manifest	manifold	methodist
lather	leather	rather
rapture	rapport	capture
sycamore	sycophant	sagamore
skirmish	skittish	stylish
phonetic	phoneme	kinetic
orient	origin	client
nimbus	nimble	omnibus
joist	joint	hoist

Unpronounceable Stimuli

target	distractors	
cda	cba	cdo
egf	epf	egh
pki	phi	qki
adn	abn	adm
rgac	rgoc	rgao
adng	admg	admq
eibm	eidm	eibn
dpea	dpoa	dpeo
aemlc	aenlc	aemlo
mgiea	mgioa	mgiae
ngimo	ngino	ngiom
chnae	chnea	chmae
trpnie	trpnei	trpmie
ieezlg	ieeslg	ieezlq
tgleue	tglene	tglueu
gblnai	gblnia	gblmai
ppwtoas	ppwtaos	ppwhoas
ooomnds	oomnids	ooomnbs
rcioadn	rciaodn	rcioabn
lsgeiom	lsgieom	lsgeoim

Pronounceable Stimuli

target	distractors	
dac	dec	dae
feg	fug	fep
kip	kep	kig
naf	nof	nah
carg	corg	cang
gand	gamd	gant
bime	beme	bine
dape	depe	dage
mecal	mecol	mecah
agime	agine	ageme
nigom	nigam	nigon
hacen	hacem	hacin
prient	priend	priont
ziegle	zieple	ziegel
legute	legote	legude
blaing	bleing	bliang
stappow	staggow	stappew
monoods	monoads	monoots
craidon	craibon	craidan
sligome	sligone	sligame

APPENDIX E

A NOTE ON PLATO TIMESHARING

The PLATO system serves a large number of users simultaneously by dividing the processing time available to each user into small packets called timeslices. When a user requests computing time from the system by pressing a key or touching the screen, the computer allots a timeslice and begins processing the user lesson. Processing continues until the computer reaches a command which signals that more input is needed from the user, or until the time in the timeslice is exhausted. In the latter case, the computer processes other users and then returns to the job that had been interrupted.

In the Timed Exposure Test, the possibility of an end-of-timeslice interruption during the processing required for initial display, masking of the target word, delay, and showing of the response choice was considered. Such an interruption could possibly interfere with the paradigm. To minimize the possibility of such an interruption, a "return" command was placed just before the section of code which controlled the processes just named. The "return" command signals the computer to end the current timeslice, resume the processing of other users, and return to process the current program with a full timeslice.

Subsequent tests indicate that the "return" command together with the relatively slow speed at which subjects went through the lesson greatly reduced the probability of an interruption affecting the critically timed presentation of test items. The first test placed the timing unit and a return command in a tight loop. After about 20 interactions, an automatic interrupt occurred, at which point the system indicated a computer usage of 3.3 TIPS (thousand of instructions per second). Thus when a program's computer usage rate approaches 3.3 TIPS, an automatic interruption is possible. However, this usage rate could not be reached by a subject who is not already familiar with the test unless he or she responded randomly. The average usage rate for all users of the lesson was only 1.8 TIPS.